



September 14, 2020

Mr. Frank Antill
Treasurer
Marietta City Schools
111 Academy Drive
Marietta, Ohio 45750

RE: Preliminary Stormwater Analysis
New PK-12 School

Dear Mr. Antill,

Provided is the Preliminary Stormwater Analysis for the new PK-12 School which was performed to determine the feasibility of providing the necessary stormwater management required for the new PK-12 School. The analysis involved using information provided by Lesko Architecture including the existing site survey, latest site layout and the geotechnical report to develop a preliminary hydraulic model to analyze pre-developed and post-developed flows from the proposed new school site. The analysis indicated detention could be provided on-site to manage site runoff meeting City of Marietta stormwater requirements and Ohio EPA water quality requirements. While the analysis is preliminary adjustments to the basin(s) should be feasible to accommodate final design layout.

Technical documentation has been provided identifying assumptions and parameters used within the hydraulic model. While the data provided is detailed the hard surface (impervious site area) will most likely change once the final design layout is established. Changes to the hard surface, design finished floor and the design of the storm sewers will require adjustment to the hydraulic model and basin(s) as necessary to meet the requirements of the City Marietta and the Ohio EPA.

If you have any questions regarding this preliminary analysis please do not hesitate to contact us at 330.375.9225 or bedelltucci@sbcglobal.net.

Sincerely,

Bob Tucci, P.E.

**MARIETTA CITY SCHOOL
MARIETTA, OHIO**

Washington County

Preliminary Stormwater Analysis

By:

Bedell Tucci, LLC
254 W. Market Street
Akron, Ohio 44303

September 14, 2020

**MARIETTA CITY SCHOOLS
PRELIMINARY STORMWATER ANALYSIS
9-14-2020**

I. Summary

Based on the information provided by Lesko Architecture and the developed hydraulic model, this preliminary stormwater analysis indicated detention could be provided on-site to manage site runoff to meet the City of Marietta stormwater requirements and the Ohio EPA water quality requirements.

II. Introduction

Bedell Tucci, LLC was retained by Marietta City Schools to provide a preliminary stormwater analysis for the new PK-12 school proposed on the campus of Washington College State. This is a general study to determine if stormwater management is feasible for the site. The following report provides documentation supporting the conclusions identified in the summary.

The analysis was developed using the following information provided by Lesko Architecture:

1. AutoCad survey of the site with 2' contours,
2. A proposed layout in pdf format overlayed on an aerial image, and
3. Geotechnical report 01021553 (dated 7-22-2019) prepared by PSI, Inc.

The analysis is also based on meeting the guidelines of the City of Marietta Storm Water Management Plan dated 12/15/2016 and the Codified ordinances of the City of Marietta.

The Marietta standards and Codified Ordinance 1154.04 require the use of the Critical Storm Method for determining allowable post-developed flows. The Critical Storm method requires all post developed flow for storm events equal to and less frequent than the determined critical storm to be no greater than the calculated 1-year pre-developed flow. This report will provide preliminary pre-developed and post-developed flows and identify potential locations for detention basins necessary to control the post-developed flow to that required by the City of Marietta. The calculations correspond to the information regarding existing conditions and proposed conditions mentioned earlier.

Since design of the site and building has not been finalized this report involves verifying the feasibility of providing stormwater detention on-site while meeting the guidelines of the City of Marietta. A detailed design is not included and adjustments and modifications to the calculations will be required once the design has been finalized. For instance, runoff coefficients may change based on the final layout configuration and amount of proposed impervious (hard surface), flows will change, drainage areas and project area may need refined, and the basin size will also change based on the final calculations and post-developed parameters. However, the general location of the detention basins should allow for flexibility to adjust surface area and volume as needed to meet final project layout and the City requirements.

In addition to runoff control the Ohio EPA also requires all projects within the State of Ohio that disturb over 1 acre to provide water quality according to the Ohio General Construction Permit. This preliminary analysis also addresses meeting this requirement.

III. Preliminary Stormwater Analysis

EXISTING SITE

The existing site is owned by Washington College State and based on information provided the project area is approximately 55 acres. Soil types are Upshur silty clay loam and Upshur association. The site is heavily

wooded and the analysis has conservatively assumed the entire area to be wooded. The CN runoff coefficient which is a parameter which quantifies the ground cover/condition of the site was determined to be 70 for existing conditions.

PROPOSED SITE

As noted the project site is approximately 55 acres. In addition there are approximately 12.0 acres of off-site area tributary to the project site. Review of the existing site topography and the proposed layout indicates the site consists of two drainage areas. The new PK-12 disturbs approximately 50 acres including the drive and alternate drive directly off of Glendale Road. This area will be routed through extended detention basin #1. Due to the existing grades of the drive towards the southwest routing this flow to basin #1 was not feasible. In order to control this runoff a second basin was identified during this preliminary analysis to capture the runoff from this new access drive. The proposed building's finished floor elevation was assumed to be 792 based on the geotechnical report.

Establishing a finished floor elevation for the preliminary analysis was necessary to determine if the site runoff could be routed via storm sewers to the proposed basin via gravity and with sufficient pipe cover. The preliminary study was based on a new PK-12 finished floor noted within the geotechnical report of 792. The preliminary analysis finished floor may require adjustment to ultimately balance site earthwork and connect to existing contours. However, the existing contours at the area of proposed Basin #1 should allow for adjustment in basin height and surface area as needed to accommodate the established design finished floor. A higher finished floor should not have a significant impact on the basin location, a lower finished floor may require the basin to be moved further southeast to allow for the storm sewers to daylight into the basin. Existing grades are close to 3:1 further down the slope, basin design (grading and connecting to existing contours) will become more challenging should the basin slide further southeast.

The SCS TR-55 method was utilized for modeling flows and runoff for the project. IntelliSolve's Hydraflow Hydrographs software was used to develop flows, size the stormwater detention systems and outlet structures. Table 1.0 and Table 2.0 summarize proposed site flows for Basin #1 and Basin #2 without providing detention and the flow with the post-developed runoff routed through the basins. The allowable flows for the basins are also shown.

Table 1.0
Post-Developed Flows
Extended Detention Basin #1
50 acres with Off-site Pass Thru of additional 8.7 ac

Storm Event	Post-developed Flow without Detention (cfs)	Post-developed Flow with Detention (cfs)	Post-developed Allowable Flow (cfs)
1	64.45	5.30	14.75
2	85.94	8.60	17.15
5	115.12	10.28	20.65
10	139.86	11.97	23.78
25	174.25	16.30	28.33
50	202.11	44.37	115.68
100	231.66	88.33	140.56

Table 2.0
Post-Developed Flows
Extended Detention Basin #2
4.7 acres with Off-site Pass Thru of additional 3.3 ac

Storm Event	Post-developed Flow without Detention (cfs)	Post-developed Flow with Detention (cfs)	Post-developed Allowable Flow (cfs)
1	6.78	0.29	2.54
2	9.45	0.35	3.44
5	13.21	0.42	4.77
10	16.53	0.47	6.02
25	21.23	1.29	7.83
50	25.09	4.61	15.80
100	29.24	12.39	19.12

The existing flows and proposed stormwater flows routed through the extended detention basins are summarized in Table 3.0.

Table 3.0
Stormwater Summary

Storm Event	TOTAL ALLOW-ABLE FLOW (54.7 ac) (cfs)	POST DEV FLOW (Basin#1) (58.7 ac) (cfs)	POST DEV FLOW (Basin#2) (8.0 ac) (cfs)	TOTAL POST DEV FLOW (cfs)	CHANGE FROM ALLOW-ABLE (cfs)
1-year	17.29	5.30	2.91	8.21	-9.08
2-year	20.59	8.60	3.99	12.59	-8.00
5-year	25.42	10.28	5.62	15.90	-9.52
10-year	29.80	11.97	7.12	19.09	-10.71
25-year	36.16	16.30	9.31	25.61	-10.55
50-year	131.48	44.37	17.61	61.98	-69.50
100-year	159.68	88.33	21.28	109.61	-50.07

The Critical Storm for the project area was determined to be the 25-year event, see Exhibit 1.

IV. Supporting Material

A. Pre-developed Parameters and Flows

Existing drainage area and flow:

Table 4.0 identifies the pre-developed site drainage parameters.

**Table 4.0
Pre-Developed
Drainage Area Parameters**

Area	Drainage Area (acres)	CN	Tc (min)
Ext. Det. Basin #1	50	70	22
Ext. Det. Basin #2	4.7	70	20

Table 5.0 and Table 6.0 summarize the predeveloped and allowable flows for Basin #1 and Basin #2 drainage areas, respectively.

**Table 5.0
Basin #1
Pre-Developed Allowable Flows (cfs)
(On-site = 50 ac; Off-site = 8.7 ac)**

Storm Event	Pre- Developed Site Flows (cfs)	Allowable On-Site Flow (cfs)	Off-Site Flow (cfs)	Allowable Post-Developed Site Flows (cfs)
1	10.41	10.41	4.34	14.75
2	20.17	10.41	6.74	17.15
5	36.25	10.41	10.24	20.65
10	51.30	10.41	13.37	23.78
25	73.83	10.41	17.92	28.33
50	93.19	93.19	21.77	115.68
100	114.61	114.61	25.95	140.56

Table 6.0
Basin #2
Pre-Developed Allowable Flows (cfs)
(On-site = 4.7 ac; Off-site = 3.3 ac)

Storm Event	Pre-Developed Site Flows (cfs)	Allowable On-Site Flow (cfs)	Off-Site Flow (cfs)	Allowable Post-Developed Site Flows (cfs)
1	0.82	0.00	1.72	2.54
2	1.59	0.82	2.62	3.44
5	2.85	0.82	3.95	4.77
10	4.02	0.82	5.20	6.02
25	5.78	0.82	7.01	7.83
50	7.28	7.28	8.52	15.80
100	8.95	8.95	10.17	19.12

B. Post-developed Parameters and Flows

The site post-developed drainage area is approximately 66.7 acres with 12.0 acres from off-site areas tributary to two (2) detention basins. Approximately 58.7 acres are tributary to Basin #1 with 8.7 acres from offsite areas. Approximately 8.0 acres are tributary to Basin #2 with 3.3 acres from offsite areas. Both basins have been analyzed as dry extended detention basins. The dry extended detention basin controls the rate of runoff from the basin and also provides water quality as required by the Ohio EPA Construction General Permit. For Basin #1 and Basin #2 the existing rims and inverts of downstream storm structures will require verification.

The drainage area, CN and Tc related to the detention basins is provided in Table 7.0.

Table 7.0
Post-Developed
Drainage Area Parameters

Area	Drainage Area (acres)	CN	Tc (min)
Ext. Detention Basin #1	58.7	87.0	15
Ext. Detention Basin #2	8.0	86.4	10

Post-developed drainage areas are shown in Exhibit 2. Post-developed flows, water elevations, and storage volumes for extended detention Basins #1 and #2 are summarized in Table 8.0 and table 9.0, respectively.

Table 8.0
Post-Developed
Extended Detention Basin #1 – 58.7 acres)

Storm Event	Post-developed Flow (cfs)	Water Elevation (feet)	Basin Storage (cf)
1	5.30	775.49	105,461
2	8.60	776.10	138,689
5	10.28	777.07	194,783
10	11.97	777.91	245,476
25	16.30	778.99	314,719
50	44.37	779.40	342,117
100	88.33	779.81	369,917

Table 9.0
Post-Developed
Extended Detention Basin #2 – 8.0 acres)

Storm Event	Post-developed Flow (cfs)	Water Elevation (feet)	Basin Storage (cf)
1	0.29	769.04	12,138
2	0.35	769.62	17,515
5	0.42	770.41	25,476
10	0.47	771.07	32,689
25	1.29	771.60	39,117
50	4.61	771.69	40,182
100	12.39	771.81	41,669

C. Water Quality

A preliminary calculation indicates the water quality volume required to be treated is approximately 70,000 c.f. Water quality has been calculated and designed based on EPA NPDES Construction Permit OHC-000005 and the “Ohio Rainwater and Land Development Manual”. Two (2) dry extended detention basins have been included in the site design to meet the water quality requirements.

V. Conclusion

As noted in the Summary, based on the information provided by Lesko Architecture and the developed hydraulic model, this preliminary stormwater analysis indicated detention could be provided on-site to manage site runoff to meet the City of Marietta stormwater requirements and the Ohio EPA water quality requirements. While the analysis was preliminary, adjustments to the basin(s) should be feasible to accommodate final design layout.

EXHIBIT 1

CRITICAL STORM CALCULATIONS

PREDEVELOPED RUNOFF VOLUMES

1-YR/24-HOUR RAINFALL:

2.15

Inches

	Sq. Feet	Acres	CN-value
IMPERVIOUS AREA	0	0.000	98
GRASS AREA		0.000	74
WOODED AREA	2,375,530	54.535	70
TOTAL AREA	2,375,530	54.53	
WEIGHTED CN-VALUE	70.000		

$$S = 4.286$$

$$S = (1000/CN) - 10$$

$$Q = 0.300$$

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

$$VOL = 1.362$$

$$VOL = (Q * 53.33 * AREA \text{ in sq miles})$$

POSTDEVELOPED RUNOFF VOLUMES

	Sq. Feet	Acres	CN-value
IMPERVIOUS AREA	904,305	20.760	98
GRASS AREA	1,471,225	33.775	80
WOODED AREA	0	0.000	0
TOTAL AREA	2,375,530	54.535	
WEIGHTED CN-VALUE	86.852		

$$S = 1.514$$

$$S = (1000/CN) - 10$$

$$Q = 1.015$$

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

$$VOL = 4.614$$

$$VOL = (Q * 53.33 * AREA \text{ in sq miles})$$

INCREASE RUNOFF %: **238.84%**

$$RUNOFF \% = \frac{(POST VOL - PRE VOL) * 100}{(PRE VOL)}$$

25 YEAR CRITICAL STORM